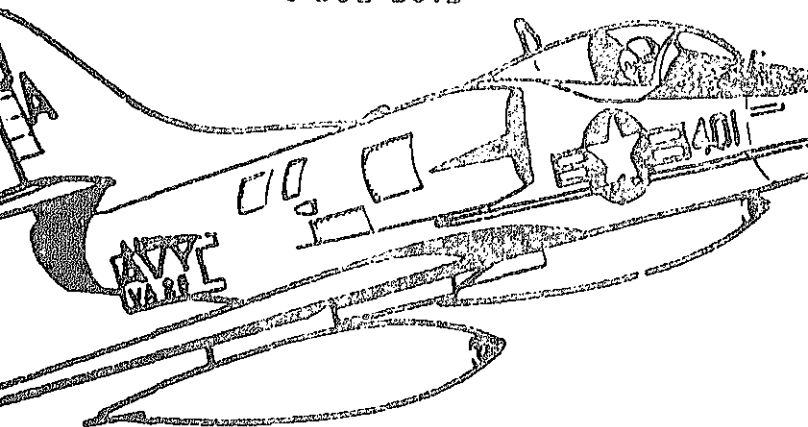


C-602-2012



## UNIT 9

# ELECTRICAL SYSTEM MAINTENANCE

## PART 2

CNTT-M1042 (REV 9-82)

PREPARED BY

NAVAL AIR TECHNICAL TRAINING CENTER

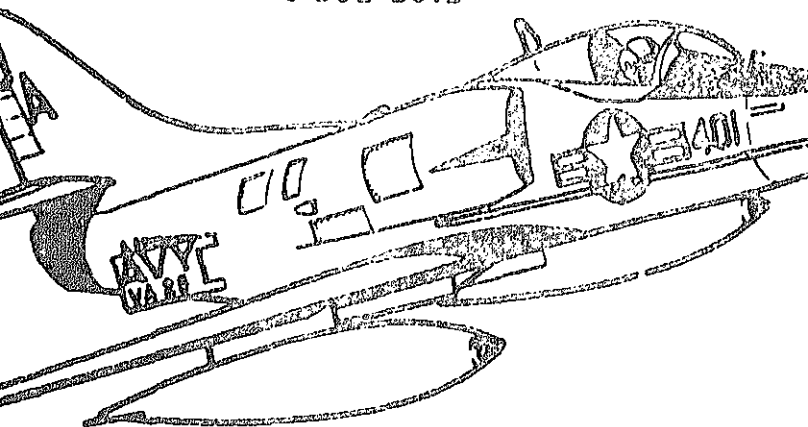
NAVAL AIR STATION MEMPHIS

MILLINGTON, TENNESSEE

PREPARED FOR

NAVAL TECHNICAL TRAINING COMMAND

C-602-2012



## UNIT 9

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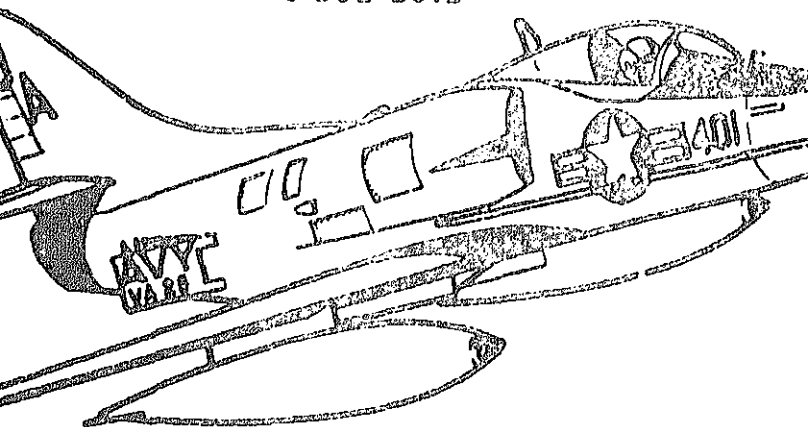
NAVAL AIR STATION MEMPHIS

MILLINGTON, TENNESSEE

PREPARED FOR

NAVAL TECHNICAL TRAINING COMMAND

C-602-2012



## UNIT 9

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PREPARED BY

NAVAL AIR TECHNICAL TRAINING CENTER

NAVAL AIR STATION MEMPHIS

MILLINGTON, TENNESSEE

PREPARED FOR

NAVAL TECHNICAL TRAINING COMMAND

REVIEW OF THE MAINTENANCE INSTRUCTION MANUAL	
AIRCRAFT LIGHTING . . . . .	
RESISTIVE-TYPE FIRE DETECTION SYSTEM. . .	
ANGLE OF ATTACK SYSTEM. . . . .	
GASES AND THE ATMOSPHERE. . . . .	
PITOT-STATIC SYSTEM . . . . .	
AIRSPED INDICATOR. . . . .	
ALTIMETER . . . . .	
RATE OF CLIMB INDICATOR . . . . .	
TROUBLESHOOTING PITOT-STATIC SYSTEM . .	
A-C MOTORS. . . . .	
FLIGHT CONTROL TRIM . . . . .	
DAILY, PREFLIGHT, TURNAROUND AND	
SPECIAL INSPECTIONS . . . . .	
CALENDAR/PHASED INSPECTION. . . . .	

AIRCRAFT LIGHTING . . . . .	
RESISTIVE-TYPE FIRE DETECTION SYSTEM. . .	
ANGLE OF ATTACK SYSTEM. . . . .	
GASES AND THE ATMOSPHERE. . . . .	
PITOT-STATIC SYSTEM . . . . .	
AIRSPED INDICATOR. . . . .	
ALTIMETER . . . . .	
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A-C MOTORS. . . . .	
FLIGHT CONTROL TRIM . . . . .	
DAILY, PREFLIGHT, TURNAROUND AND	
SPECIAL INSPECTIONS . . . . .	
CALENDAR/PHASED INSPECTIONS . . . . .	

- 4.9 Maintain, under supervision, the Aircraft Interior and Exterior in accordance with applicable Maintenance Instruction Manual on assigned aircraft.
- 4.10 Maintain, under supervision, the Aircraft Fire Warning System in accordance with applicable maintenance instruction manual on assigned aircraft.
- 4.11 Maintain, under supervision, the Aircraft Flight Instruments System consisting of Angle of Attack, Pitch and Accelerometer in accordance with applicable Maintenance Instruction Manual on assigned aircraft.
- 4.12 Maintain, under supervision, the Aircraft Flight Control Trim (Manual) in accordance with applicable maintenance instruction manual on assigned aircraft.
- 5.0 Perform scheduled maintenance on assigned aircraft in accordance with applicable maintenance requirement card data.

Select the purpose of the Maintenance Instr

Select the information that is contained in the Maintenance Instruction Manual.

Select the information that is required within the Maintenance Instruction Manual.

Match the statement that correctly describes a typical section breakdown.

Given the MIM, Aircraft Modifications and Bureau Number, select the page and paragraph for the removal and installation procedures of a system component.

Given the MIM, Aircraft Modifications and Bureau Number, select the page and figure for a given wiring diagram.

Given the MIM, Aircraft Modifications and Bureau Number, select the page and paragraph for the description of a system and/or component.

---

Electricity, NAVPERS 10086-B, Chapter 3

Electrician's Mate 3 & 2, Chapter 7

a.

b.

c.

SECTION BREAKDOWN:

a. INTRODUCTION

b. Aircraft Change and Bulletin Summary

c. Table of Contents

d. Tables

e. Illustrations

f. Alphabetical Index

Procedure for using the MIM

del of A/C only

more models of the same type A/C  
on, function, operation and testing  
1, installation, adjusting and troubleshoot  
ations 5 through 7 Bureau Number 149577 and  
506 will be utilized.  
e changes AFC-278, AFC-451, and Aircraft Se  
have been incorporated.

description of the floodlight system and f  
aragraph number.

PARAGRAPH \_\_\_\_\_

wiring diagram for the Speedbrake Control  
n the page and paragraph.

PARAGRAPH \_\_\_\_\_

removal and installation procedures for th  
mbly and fill in the page and paragraph num

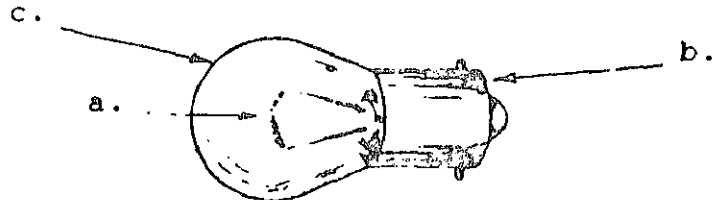
PARAGRAPH \_\_\_\_\_

2. LABEL the components of aircraft
3. MATCH the shape of aircraft lamp letter designation.
4. SELECT from a list the descriptive to the rating of aircraft lamps
5. SELECT from a list the components of gas discharge lighting.
6. SELECT from a list the purpose
7. SELECT from a list the type of that is used for signaling the
8. MATCH the type of exterior light statement that indicates its purpose.
9. TROUBLESHOOT and REPAIR given a typical lighting system on an aircraft

---

## REFERENCES

1. Aviation Electrician's Mate 3 & 2, M Pages 123-139
2. Handbook of Maintenance Instructions 01-40AVA-2-10, Pages 10-120, 10-135
3. Aircraft Lamps and Lighting, CNTT-J



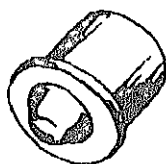
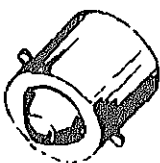
1. Construction

a. Filament

- 1)
- 2)

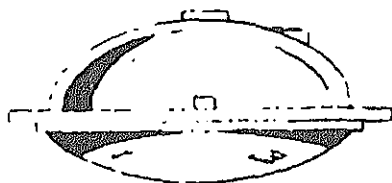
b. Base

- 1)
- 2)



c. Bulb - Common Shapes

- 1)
- 2)
- 3)
- 4)



a.  
b. Transformers

1)

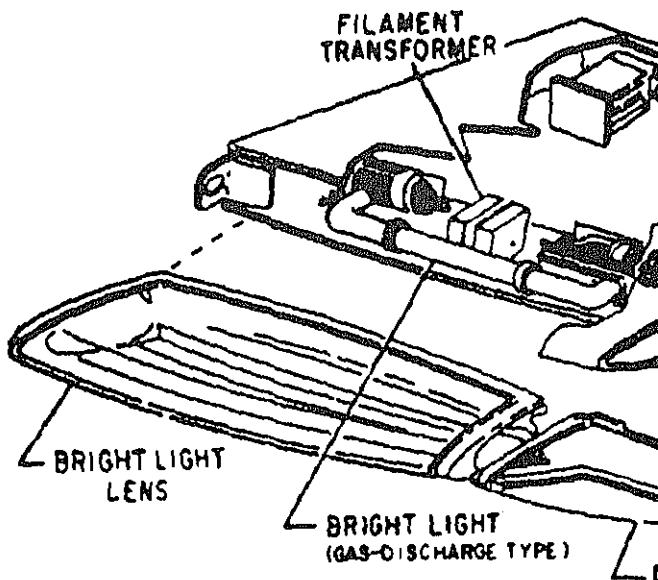
a)

b)

2)

a)

b)



2. Specifications

b. Light Assemblies

(1) Purpose

(2) Construction

(a) Housing

1.

or Lighting  
Instrument Lights

Console Lights

Cockpit Lighting

Spotlights  
(a)  
(b)

Cabin and Passageway Lights

Landing Lights

Use  
(a)  
(b)  
(c)

Intercommunication Lights

3. Exterior Lighting

a. Navigation Lights

(1)

(2)

(a)

(b)

(c)

b. Fuselage Lights

(1)

(2)

(3)

c. Anti-Collision Lights

(1)

(2)

(3)

(4)

(5)

d. Landing Lights

(1) Located on Nose Wheel Door

(a)

(b)

(c)

(2)

(3) Steady Burning of Approach Lights

(a)

(b)

(4) Flashing Approach Lights

(a)

(b)

(5) No Approach Lights

(a)

(b)

(6)

## Special Purpose Lights

### 1) Join-Up Lights

(a)

(b)

(c)

### 2) In-Flight Refueling Probe Light

(a)

(b)

### 3) Taxi Lights

(a)

(b)

(c)

## Circuit Tracing And Isolating

### Circuit Tracing

1)

2)

### Circuit Isolating -- more than one leg in ci

1)

2)

... the components of the a

$$\frac{(V)^2}{I^2}$$

1. Match the shapes of aircraft  
designations.

	SHAPE	
(1)	Tubular	a
(2)	Globular	b
(3)	Straight Side	c
(4)	Parabolic	d

2. Select from the following list  
which describes how aircraft

Volts, ohms, mhos, amps.

- b. Amps, ohms, watts, candle  
c. Candlepower, amps, volts  
d. Volts, amps, watts, cand  
3. Select the components found

- a. Lamp, base transformer,  
b. Lamp transformer, ballast

Light:

Light:

navigation Light

ay Light

Type or series of lighting which the vessel is required to position and/or purpose.

Navigation Light a. Night colour code

Navigation Light b. Aids in navigation

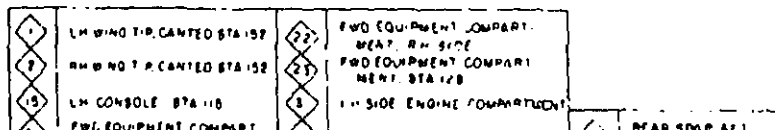
Navigation Light c. Angle of view

Lighting Light d. Light not by

Navigation Light e. Can be manually controlled

Navigation Light f. Wing and sail light

Light g. Aid in landing

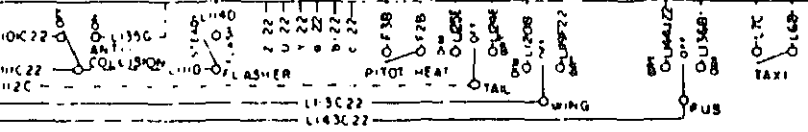
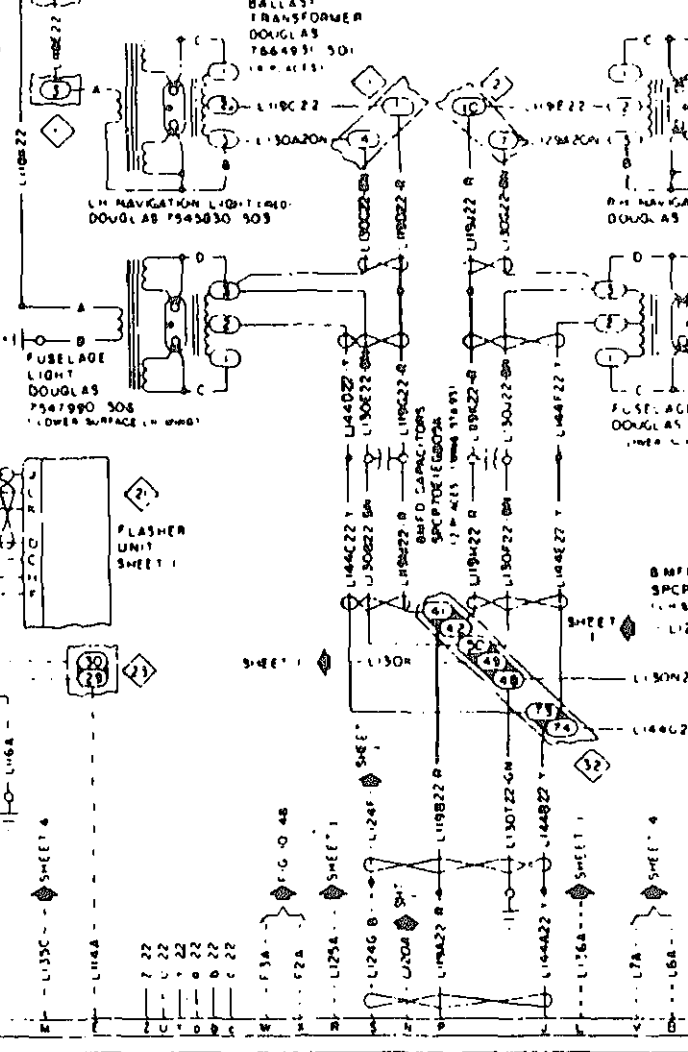


MASTER  
EXTERIOR  
LIGHT SWITCH  
MS35058 5

MASTER  
EXTERIOR  
LIGHT RELAY

L106R -  
L107B22 R  
L108B22 R  
L109B22 Y  
L109  
L100A

EXTERIOR LIGHT  
FLASHING  
RELAY

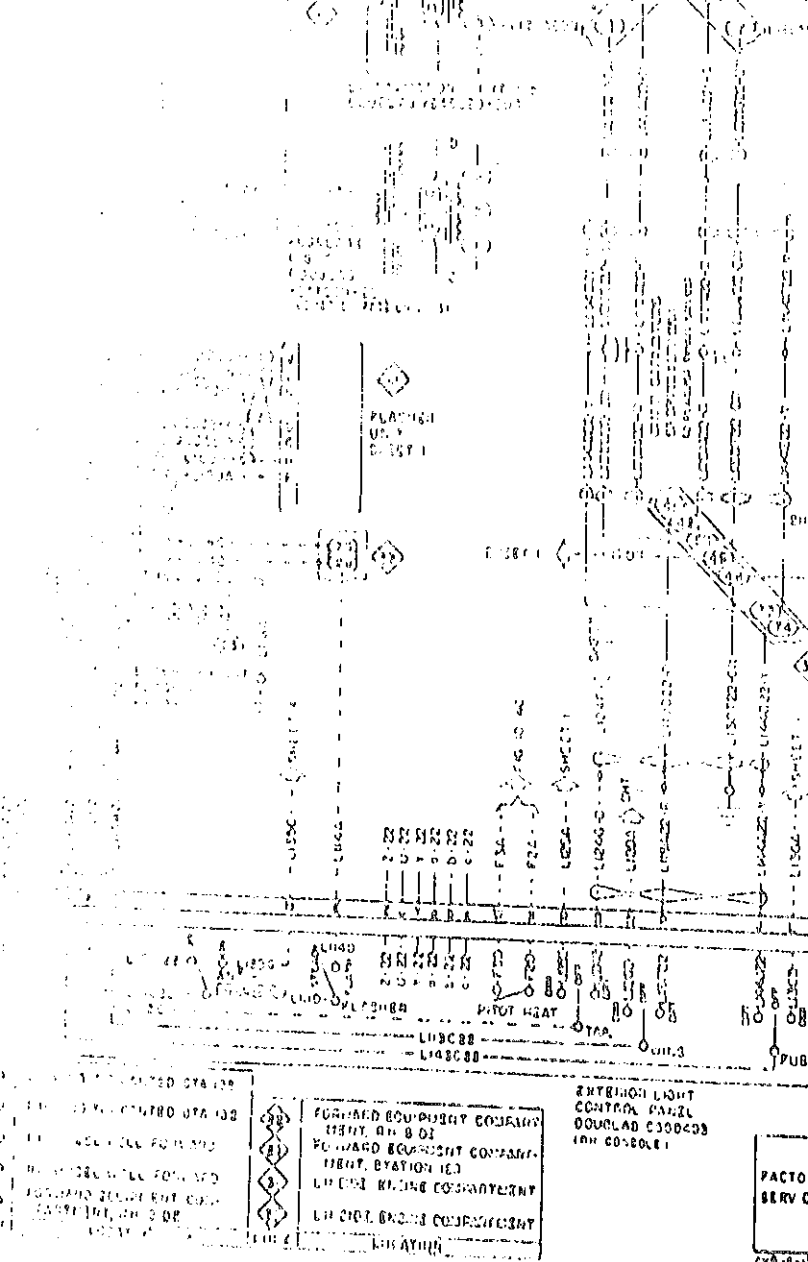


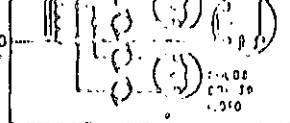
WANTED STA 152  
WANTED STA 152  
ALL FORWARD  
ALL FORWARD

FORWARD EQUIPMENT COMPARTMENT RH SIDE  
FORWARD EQUIPMENT COMPARTMENT STATION 128  
LH SIDE ENGINE COMPARTMENT

EXTERIOR LIGHT  
CONTROL PANEL  
DOUGLAS 5685493  
(1st CONSOLE)

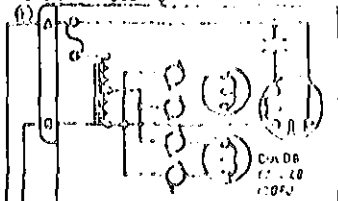
FACTORY  
SERV CHG  
EFFECTIVE  
NONE  
ALL  
10





ANTI-COLLISION LIGHT  
800000 100000  
000000 100000

CAB OCCUPANT LIGHT



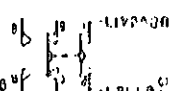
TOP FUSELOCE STATION 000 0

NOTE: THE  
CAB OCCUPANT  
LIGHT IS  
CONTROLLED BY  
THE CAB OCCUPANT  
SWITCH.

(1) (2) (3)

NOTE: THE  
CAB OCCUPANT  
LIGHT IS  
CONTROLLED BY  
THE CAB OCCUPANT  
SWITCH.

ANTI-COLLISION  
LIGHT POSITION  
INDICATION  
SWITCH  
VOLUME 10-000



CONTROL PANEL DISCONNECT D  
800000 100000

800000 100000

ANTI-COLLISION

EXTERIOR LIGHT CONTROL  
PANEL SHEET 800 0

NOTE: THE  
CAB OCCUPANT  
LIGHT IS  
CONTROLLED BY  
THE CAB OCCUPANT  
SWITCH.

HEEL WELL FORWARD  
HEEL WELL FORWARD  
AND EQUIPMENT COMPARTMENT,  
SIDE

NOTE

W PER MIL-W-1000 100000

NOTE: THE  
CAB OCCUPANT  
LIGHT IS  
CONTROLLED BY  
THE CAB OCCUPANT  
SWITCH.



SELECT from a list the purpose of the Fire Detection System.

MATCH the selected components of the Resis Type Fire Detection System with the statement that pertains to their function or purpose

SELECT from a list the statements which pertain to the illumination of the fire warning light

SELECT from a list the statement which is regarding the element configuration during closure of the test switch.

---

CES

---

Handbook of Maintenance Instructions (S2A, B and C)  
01-855AA-2, 15 March 1965

Electrician's Mate 3 & 2, NAVPERS 10340  
Pages 370-372

a. Sensing Elements  
(1)

(2)

(3)

(4)

(5)

(6)

b. Control Unit

(1) Functions

(a)

(b)

(c)

(2) Components Of The Control U

(a) Power Supply Transform

1.

2.

3.

(b) Tube V101 (GL 5751)

1.

2.

3.

(d) Output Transformer T101

1.

2.

Relay  
Purpose

Construction

(a)

(b)

(c)

(d)

ing Light

Switch

(a)

Changed 18 May 1969



1. Temperature Up -
2. Temperature Down -

(b) The Sensitive Element -

1.

2.

(c) V101 Will Conduct -

1.

2.

(d) V101 Controls V102

1.

2.

(e) V102

(f) Primary of T101

1.

2.

(g) Secondary of T101

b. Temperature Increase

(1)

(2)

(3)

(4)

re Decreases  
ons For Temperature Decrease

onal  
ose Test Switch

(a)

(b)

5. Maintenance And Troubleshooting  
a.

(1)

(2)

(3)

(4)

(5)

b.

overheat exists.

- c. To give an early indication of fire or heat in the protected areas.

Match the following components with the statement that best describes its function or purpose.

- |           |  |      |
|-----------|--|------|
| _____ (1) | Supplies A.C. voltage to the plates of all tubes.          | a. 1 |
| _____ (2) | Gas filled thyatron  | b. 2 |
| _____ (3) | Deenergized connects the sensing element in a closed loop. | c. 3 |
| _____ (4) | Duotriode, only one side used.                             | d. 4 |
| _____ (5) | Press to test type.  | e. 5 |
| _____ (6) | Primary is plate load for V102.                            | f. 6 |
| _____ (7) | Has a negative coefficient of temperature.                 | g. 7 |
| _____ (8) | Used to preset V101 bias.                                  | h. 8 |

Select the statement(s) that pertain(s) to the illumination of the fire warning light.

- a. An overheat condition exists in the protected areas.
- b. The bias on V101 is lowered when element temperature is decreased.
- c. The test relay is deenergized.
- d. The plate of V102 remains negative.

element configuration during the closure of switch.

- a. The system is connected in a closed loop.
- b. The inner element is connected to ground element continuity and system operation.
- c. The warning light will illuminate if the open in the sensitive element.

SELECT the purpose of the angle of attack

MATCH the angle of attack system component purpose.

MATCH illustrations of the indicator light that describe the condition they indicate

MATCH illustrations of the indicator lighting exterior approach light.

SELECT the conditions that must be met for and indicator light will operate.

ARRANGE a list of malfunctions into the code describes the operation of the indicating angle of attack system.

Given a schematic diagram of the angle of MATCH a list of symptoms to the faults the

SELECT the precautions to be observed when nance of the angle of attack system.

PERFORM an operational check of the angle on an aircraft, using a job plan.

IDENTIFY opens, shorts and high resistance attack system on an aircraft, by performing using an operational checklist, analyzing documenting them on VIDS/MAF's.

ISOLATE opens, shorts and high resistance attack system on an aircraft using a multi diagrams and logical troubleshooting proc

CORRECT opens, shorts and high resistance attack system on an aircraft by repairing replacing faulty components, performing u an operational checklist and documenting action taken on VIDS/MAF's.

NAIOPS Flight Manual Navy Model A4-C Aircraft

Handbook of Operation and Service Instructions  
Attack System, NA 05-20NB-1

Aviation Electrician's Mate 362, NAVPERS 1  
182-183, 315-319 and 362-363

ents and their purpose  
Angle of Attack Transducer

Angle of Attack Indicator

Approach Lights Relay

Retraction Release Relay

Resting Hook Position Switch

Resting Hook Bypass Relay

Resting Hook Bypass Switch

Approach Lights Relay

Indexer Lights

Approach Lights

Master Exterior Lights Relay

r/Approach Lights - Angle of Attack System

d.

e.

$\frac{1}{2} \times 100 = 50\%$

f.

g.

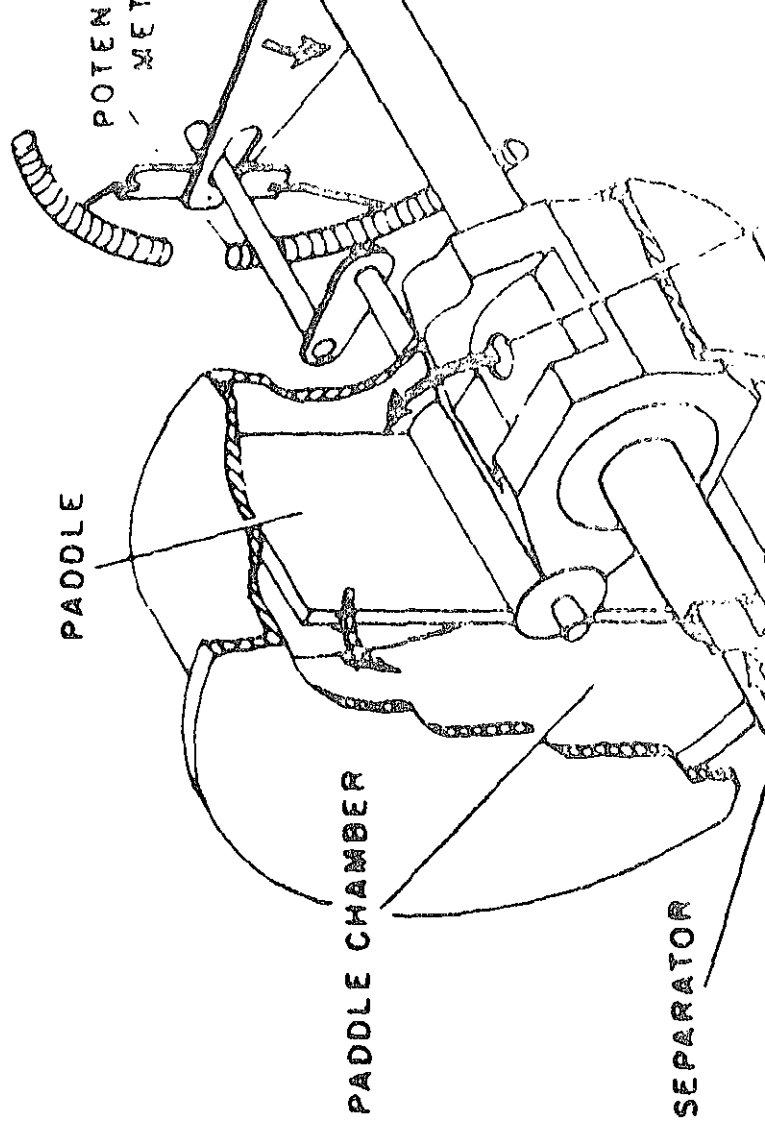
h.



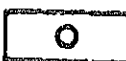

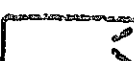
Conditions required for Approach Light op.

i.

j.

k.



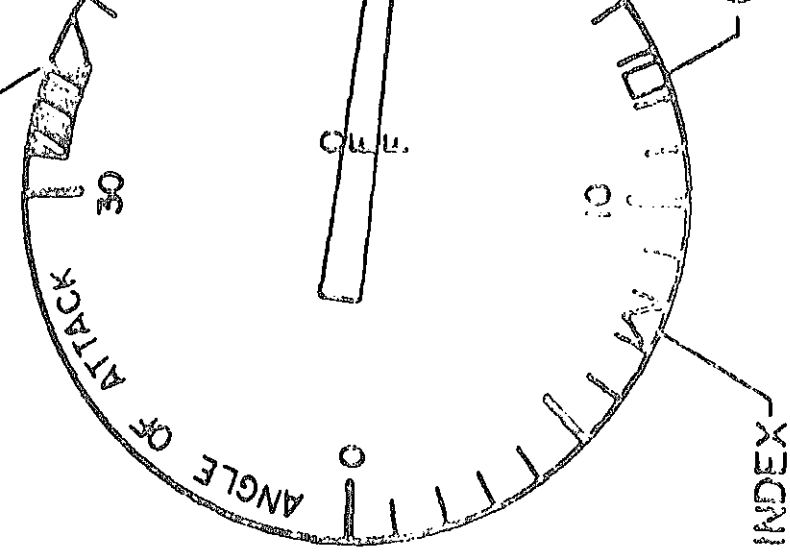
	(EXTERNAL LIGHT = GREEN)
	ANGLE-OF-ATTACK HIGH APPROACHING OR DEPARTING OPTIMUM. EXTERNAL LIGHT = AMBER
	ANGLE-OF-ATTACK OPTIMUM ("BULLSEYE") EXTERNAL LIGHT = AMBER
	ANGLE-OF-ATTACK LOW APPROACHING OR DEPARTING OPTIMUM. EXTERNAL LIGHT = AMBER
	ANGLE-OF-ATTACK TO LOW (EXTERNAL LIGHT = RED)

(B)

(C)

(D)

(E)



CONTROL

PRIMARY

ANGLE-OF-ATTACH

PRIMARY

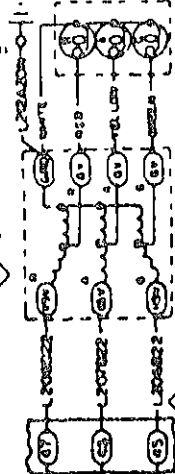
FIG 3A APPROACH LIGHT

UNIDIRECTIONAL LIGHT

- O - 0140A
- E - 0140A
- F - 0140A
- G - 022
- H - 022
- I - 022
- J - 022
- K - 022
- L - 022
- M - 022
- N - 022
- O - 022
- P - 022
- Q - 022
- R - 022
- S - 022
- T - 022
- U - 022
- V - 022
- W - 022
- X - 022
- Y - 022
- Z - 022

ANGLE-OF-ATTACH TRANSDUCER DOUGLAS

APPROACH LIGHT GAINES D 7220 B



APPROACH LIGHT TRANSFORMER DOUGLAS

APPROACH LIGHT RELAY DOUGLAS

1200 2 8A

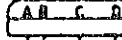
L200A22

ANGLE-OF-ATTACH INDEX LIGHT DOUGLAS 7330350-801

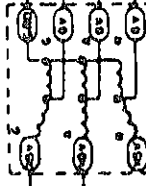


GREEN YELLOW RED

INDEX LIGHT DISCONNECT 83310PB-88 10-101908-8 POTTING BOOT 1AT 40 CLOCK



ANGLE-OF-ATTACH INDEX LIGHT TRANSFORMER DOUGLAS 1P673020 1STATION 80 1RM 4021



INDEX LIGHT RELAYS 1P6 10-70 88 1 80 2



MASTER EXTERIOR LIGHT SWITCH 1P6 10-57

MASTER EXTERIOR LIGHT RELAY FIGURE 10-

TEST SWITCH

LIGHTING FIG 10-39








emergencies.

indicate to the pilot the angular difference between the longitudinal axis of the aircraft and local airflow.






provide the pilot with regulated power setting for flight.

show the components of the angle of attack system in Column B to their purpose in Column A.

<u>COLUMN A</u> <u>PURPOSE</u>	<u>COLUMN B</u> <u>COMPONENT</u>
Provides the LSO with information pertaining to the angle of attack of the aircraft.	(1) AOA Transducer (2) AOA Indicator (3) Approach lights relay (4) Retraction lights relay
Removes power from the approach and indexer lights when the aircraft is on the deck.	(5) Arresting gear position switch
Senses any change in local airflow and transmits information to the AOA Indicator.	(6) Arresting gear position switch
Dimms the approach lights when exterior lights are on.	(7) Arresting gear position switch
Provides the pilot with AOA information in units, and sequences the indicating lights through cam switches.	(8) Approach lights relay #2 (9) Indexer lights relay
Supplies a ground for approach lights relay #2 when the hook is full down.	(10) Approach lights relay (11) Master external lights relay
Applies power to the approach lights transformer when	
needed for approach #2 during landings.	
Provides circuit for initial hook by-pass	
Provides the pilot with light	

Angle-of-Attack TOO HIGH	(1)	
Angle-of-Attack OPTIMUM ("Bullseye")	(2)	
Angle-of-Attack TOO LOW	(3)	
Angle-of-Attack LOW Approaching or Departing Optimum	(4)	
Angle-of-Attack HIGH Approaching or Departing Optimum	(5)	

Match the illustrations of the indexer light  
column A to the Approach Light color in Column

<u>COLUMN A</u> <u>INDEXER CONDITIONS</u>		<u>COLUMN B</u> <u>APPROACH LIGHT</u>
a. 	— d. 	(1) RED
b. 	— e. 	(2) GREEN
c. 		(3) AMBER

transducer transmits change in angle of indicator.  
 Aircraft nose attitude changes up or down.  
 Cam switches complete the circuit to the landing lights.  
 Change in local airflow is sensed by transducer.  
 Indicator displays new AOA and repositioning lights.  
 Check the conditions that must be met before the indexer lights will operate.

By-pass switch must be actuated for field approach.  
 Approach lights switch in the cockpit is in the correct position.  
 Tail hook is full down for carrier operation.  
 Weight off main landing gear.  
 The aircraft must be on the deck.  
 The landing gear must be down and locked.  
 The Master light switch must be in the correct position.

Refer to the wiring diagram on page 40. Match the symptoms in Column A with the faults in Column B.

COLUMN A  
SYMPTOMS

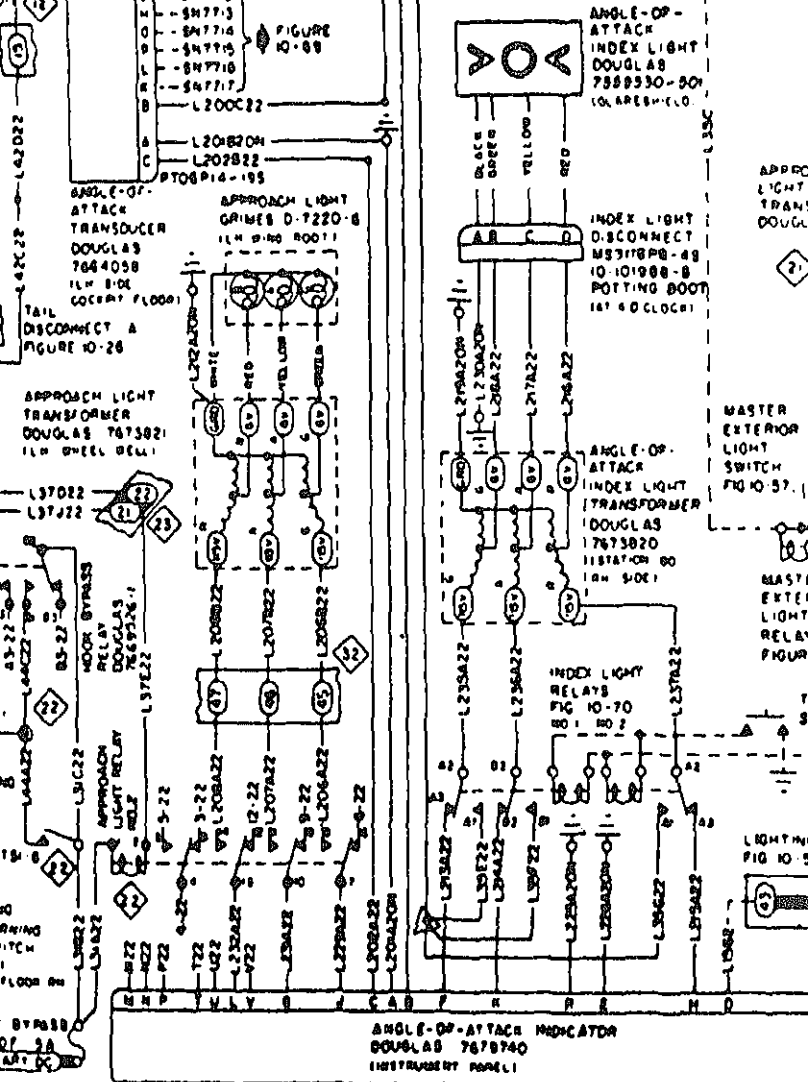
COLUMN B  
FAULTS

- |   |  |
|---|--|
| Approach lights are inoperative with the hook down.                           | (1) Retracting gear open to ground.        |
| Approach lights are on with weight on the landing gear.                       | (2) Open wire to retracting gear.          |
| Approach lights inoperative and the right main landing gear indicates unsafe. | (3) Right hand gear down out of alignment. |
| Approach and indexer lights do not change and the indicator is stuck.         | (4) Arresting switch is in wrong position. |
| Approach and indexer lights inoperative, however, the indexer lights          | (5) Connector to AOA transducer blown.     |
|   | (6) Approach lights blown.                 |

ition.

ure that the landing gear handle is down before pressing the retraction release switch.

NOT use force when moving the AOA transducer



APPROACH LIGHT AND ANGLE-OF-ATTACK INDICATOR

a state of matter.

RECH the properties of gases to the proper state.

SELECT from a list the statements concerning density of the atmosphere.

SELECT from a list the statement concerning pressure of the atmosphere in relation to altitude.

RECH the types of barometers to the proper state.

---

Physics, Dull, Metcalf and Williams, Henry H  
1960, Unit 3, Chapter 8

Electrician's Mate 3 & 2, NAVPERS 10348-C,  
9-30, 440-441

---

ions

ume

ght

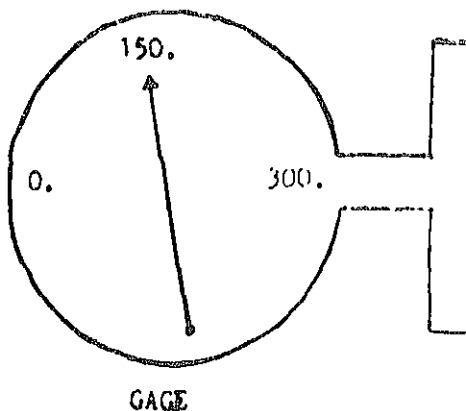
s

sity

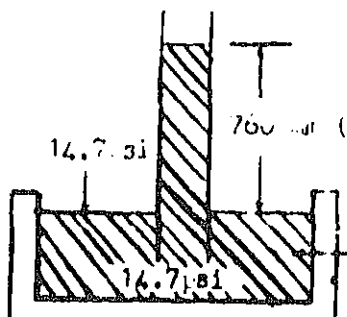
ssure

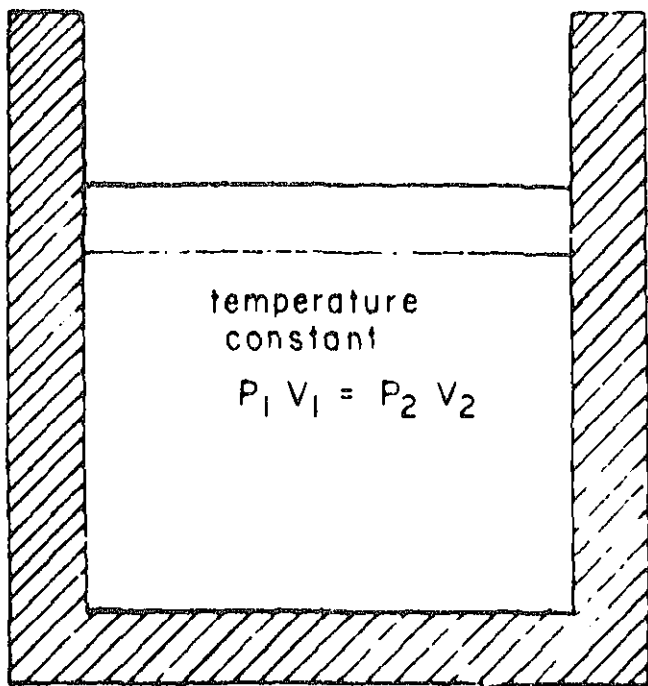
yancy

- a. Volume
  - (1)
  - (2)
- b. Density
- c. Pressure
  - (1) Absolute
  - (2) Gage



- (3) Standard

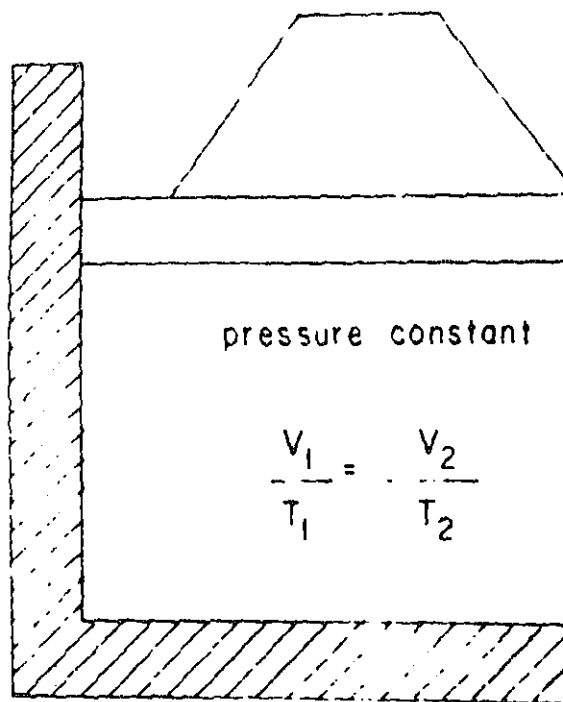




OR

$$\frac{V_1}{V_2} = \frac{P_2}{P_1}$$

the volume of, continues to,  $V_2$   
its absolute temperature, provided  $T$   
held constant



OR

$$V_1 T_2 = V_2 T_1$$

Boyle's law

a)

b)

Maxwell's law

a)

b)

c)

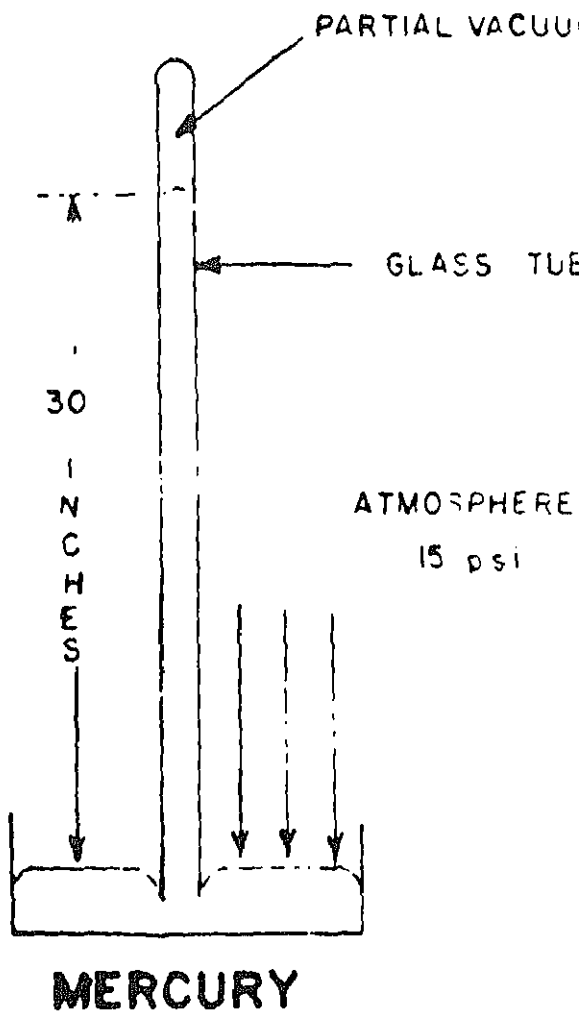
Combined Gas Law

a)

b)

ties

ensity



3.

4.

## Measuring Instruments

### 1. Mercurial Barometer

#### a. Construction

1)

2)

#### b. Operation

1)

2)

3)

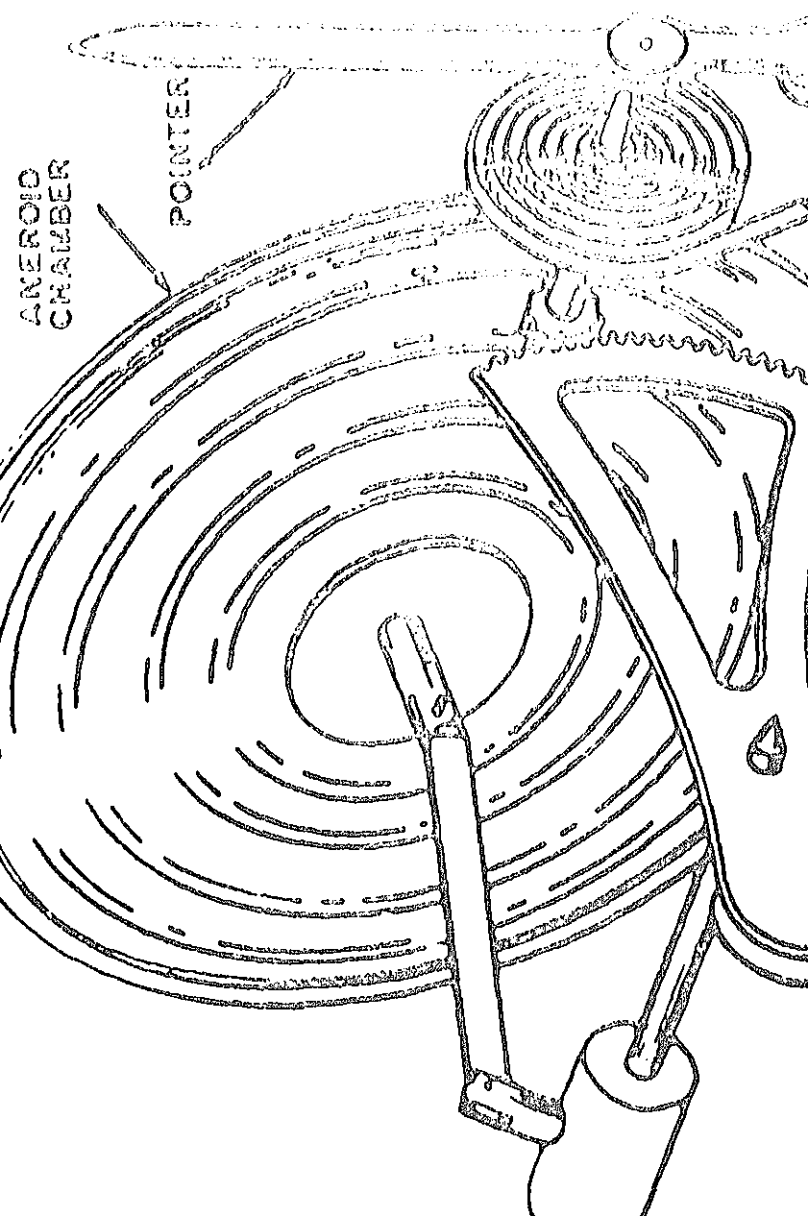
4)

#### c. Measuring Pressure

1) Explanation

a)

b)



2. Aneroid Barometer

a. Construction

1)

2)

b. Operation

1)

2)

c. Measuring Pressure

- a. Has a definite shape and volume.
- b. When placed in a container, will comply with its volume and assume its shape.
- c. Has no definite shape or volume.
- d. Its volume varies slightly with large temperature and pressure changes.

2. Match the properties of gases to the properties of liquids.

- |  |   |
|--|---|
| <p>___ (1) The upward force which any fluid exerts on a body when placed in it.</p> <p>___ (2) Weight or mass per unit volume.</p> <p>___ (3) Force per unit area.</p> | <p>a. Buoyancy</p> <p>b. Density</p> <p>c. Pressure</p> |
|--|---|

3. Select the statements concerning density of the atmosphere in relation to altitude.

- a. Decreases with an increase in altitude.
- b. Is greater at sea level than at any other altitude.
- c. Increases with a decrease in altitude.
- d. Is equal to 14.7 PSI at sea level.

4. Select the statements concerning pressure of the atmosphere in relation to altitude.

- a. Is equal to 14.7 PSI at sea level.
- b. Increases with a decrease in altitude.
- c. Is greater at sea level than at any other altitude.

is increased.

b. Aneroid

Atmospheric pressure on the fluid in the reservoir is transmitted to the fluid in the straight glass tube.

construction, and operation of the static  
pitot tube.

2. SELECT from a list the function of the tube.
3. MATCH the statements which pertain to and operation of the two types of pitot tubes.
4. SELECT from a list the statement which color coding of tubing in the pitot-static system.
5. MATCH the flight instruments with the pressures they utilize.
6. LIST seven statements which pertain to precautions followed when working with a static system.

---

## REFERENCES

---

- Naval Aircraft Instrument Handbook, NA 05-  
Section 1, Pages 9-10
- Aviation Electrician's Mate Manual, NA 00-  
Chapter 29, Pages 4-5
- Aviation Electrician's Mate 3 & 2, NAVPERS  
Pages 458-462

aration

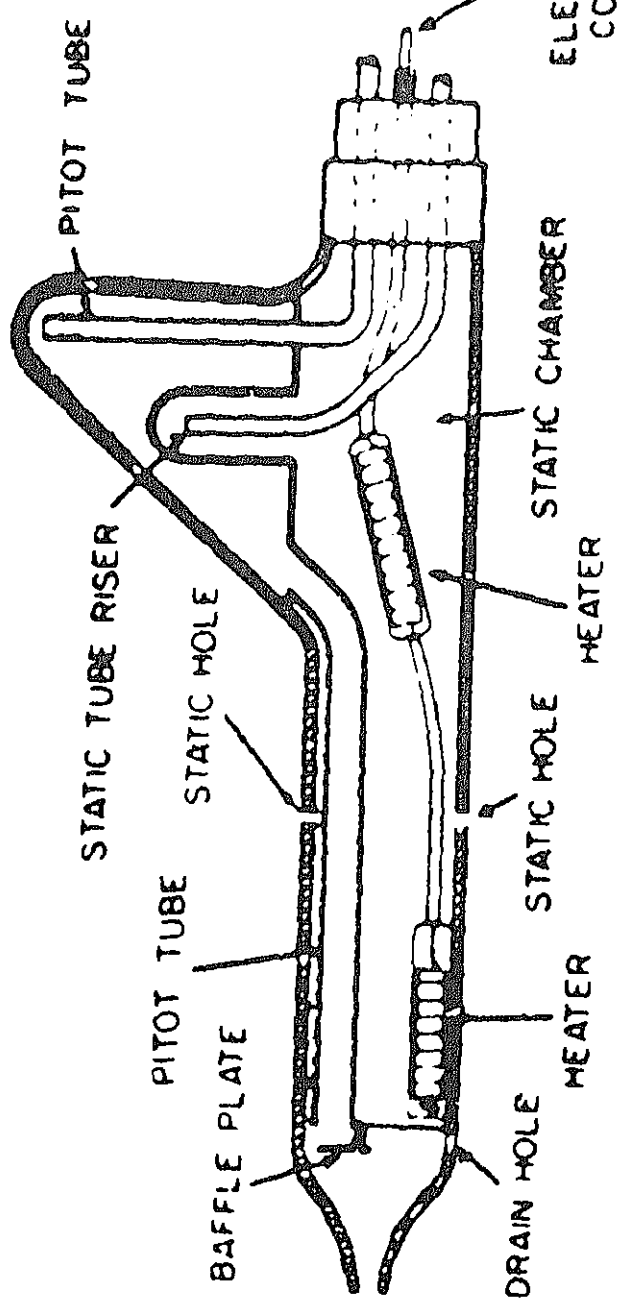
cation

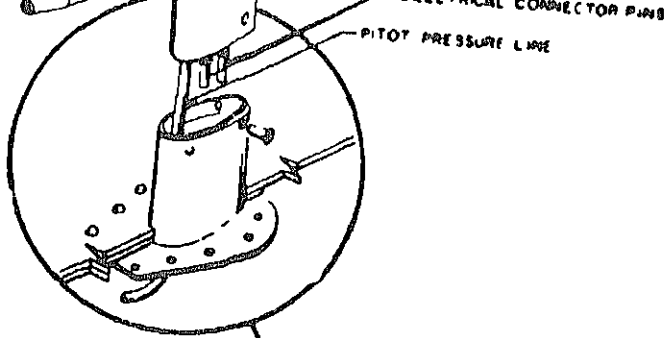
Tube  
nction  
nstruction

eration

Static Tube  
nction

pes  
) Sharkfin





struction

ration

Pitot Pressure

(a)

(b)

(c)

(d)

(e)

Static Pressure

(a)

(3) Connecting Line

(4) Heating Elements

(a)

(b)

(c)

(d)

## System Installation

a. Pitot-Static Tubes -

b. Pitot Tubes -

c. Static Vents -

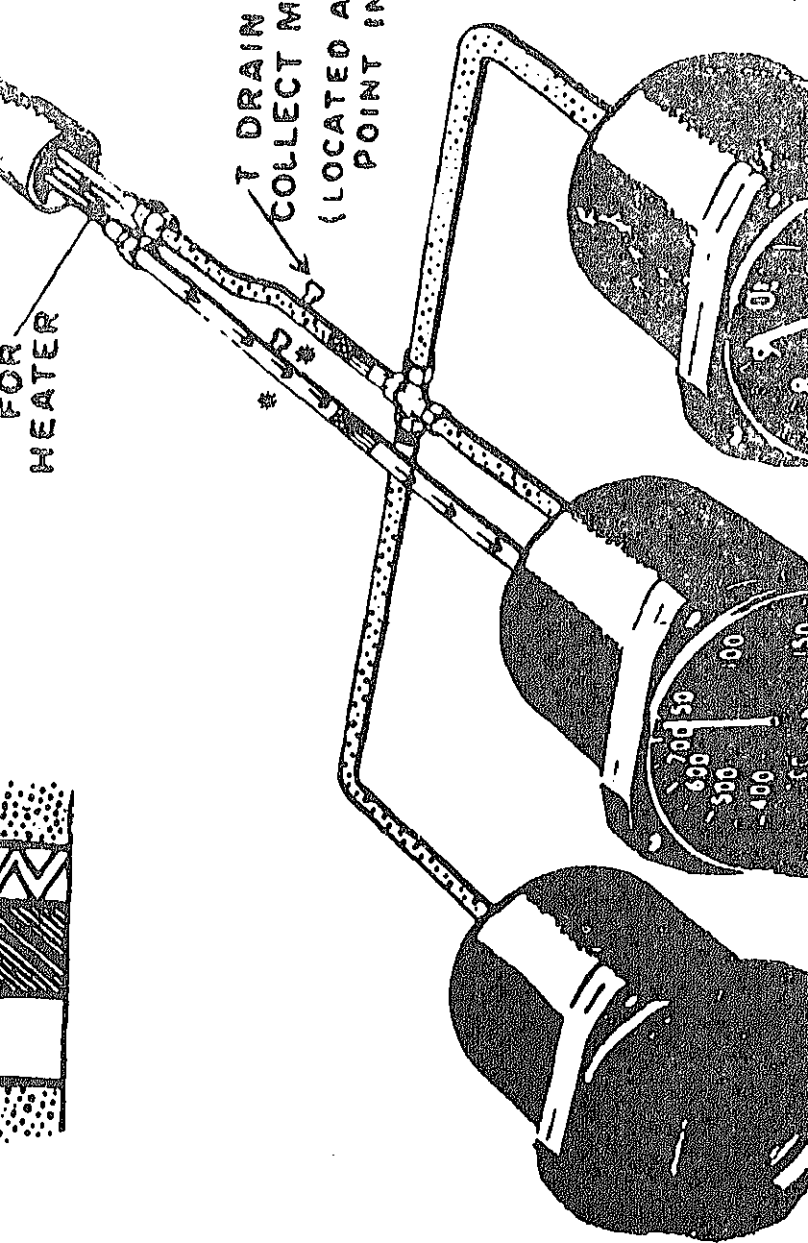
d. Connecting Lines -

e. Tubing Identification -

(1)

(2)

(3)



6. Safety Precautions

a.

b.

c.

d.

e.

f.

g.

Static vent:

Function

- a. A round or oval tube with an internal chamber.

Construction

Operation

- b. A device that collects pitot pressure only.

- c. Heating element controlled by a switch in the cockpit.

Pitot tube:

Function

- d. A flat, oval-shaped plate with a hole in the center.

Construction

Operation

- e. Air strikes the base of the plate and water is separated and expelled from the drain.

- f. A device that collects pitot pressure only.

- g. Atmospheric pressure enters the hole in the center of the plate.

the function of the pitot-static tube.

device that collects pitot pressure only.

device that collects pitot and static pressure.

device that is activated by the difference between pitot and static pressures.

device that detects a change in static and dynamic pressures.

the statements which pertain to the construction and operation for each of the two types of pitot-static tube.

Pressure is directed to the rear of the tube and then through the connector.

a. Sharkfin

b. Horizontal

the riser trap and then  
through the connector.

4. Has one heating element.

4. Select the statement which identifies color of tubing in the pitot-static system.

- a. Orange and gray band
- b. Yellow and red band
- c. Black and green band

5. Match the flight instruments with the type they utilize.

\_\_\_ 1. Airspeed indicator

a. Static

\_\_\_ 2. Altimeter

b. Pitot

\_\_\_ 3. Rate of climb indicator

6. List seven safety precautions for the pitot-static system.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_
- f. \_\_\_\_\_
- g. \_\_\_\_\_

SELECT from a list the function of the airspeed indicator.

MATCH the components of the airspeed indicator with their related statements.

SELECT from a list the statement which pertains to the function of the maximum allowable airspeed indicator.

SELECT from a list the statement which pertains to the function of the mach number indicator.

SELECT from a list the purpose of maintenance checks of the airspeed indicator.

MATCH the pointers or dial that indicate mach number, maximum allowable airspeed, and indicated airspeed with statements pertaining to the moving forces.

ES

Electrician's Mate 3 & 2, NAVPER 10340-10-462-465

Electrician's Mate Manual, NAVPER 00-10-462-465, Chapter 29

Book of Operation and Service Instructions for Airspeed Indicators, AN 05-10-23, May 1950

Book of Operation and Service Instructions for Mach Number Indicators, NA 05-10-501, June 1945, Chapter 6

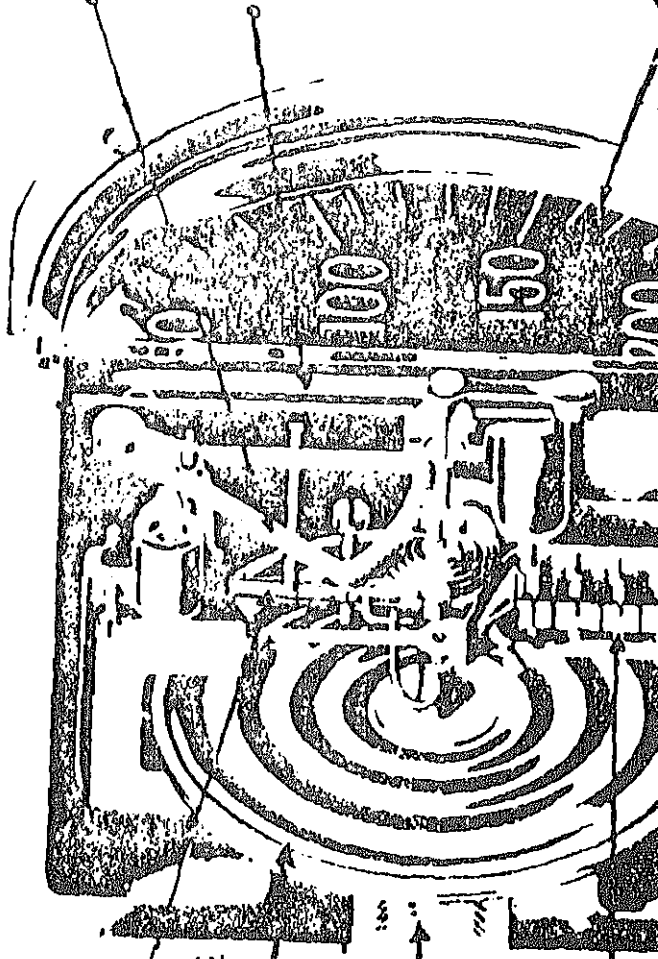
Book of Operation and Service Instructions for Mach Number Indicator, NA 05-10-549, Feb 1950

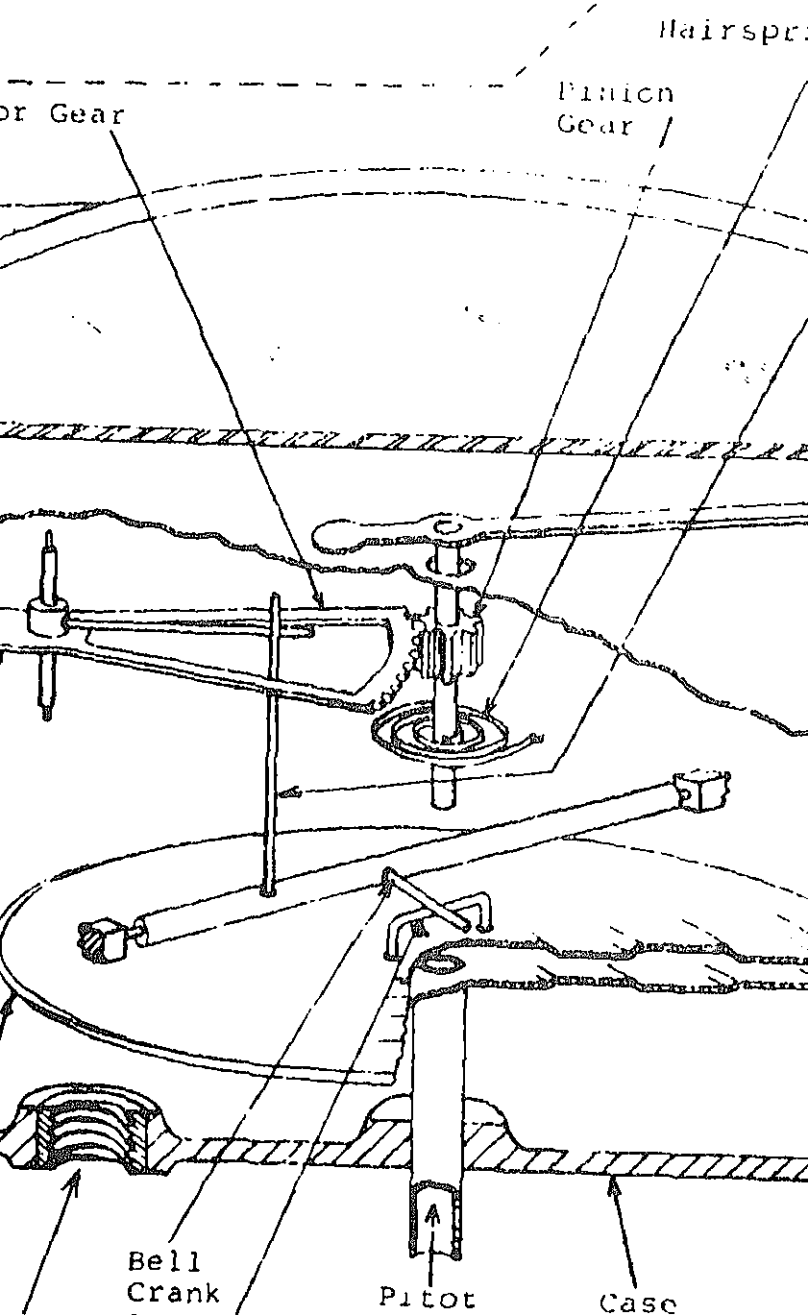
LEVER

ST (DYNAMIC) PRESSURE  
DIAPHRAGM

PITOT PRESSURE  
PORT

CALIBRATION  
SCREWS





(1) Function

(2) Operation

c. Temperature Compensation Device

d. Multiplying Mechanism

e. Instrument Face

(1) Function

(2) Types

(3) Operation

Modifications

a. Maximum Allowable Speed

(1) Function

(2) Operation

Operation

nce Checks  
ose

d

... indicates to the pilot the speed through the surrounding air.

2. Match the components of the airspeed their related statements.

- |   |    |
|---|----|
| ___ (1) Case                            | a. |
| ___ (2) Diaphragm                       |    |
| ___ (3) Temperature compensation device | b. |
| ___ (4) Multiplying mechanism           |    |
| ___ (5) Instrument face                 | c. |
|   | d. |
|   | e. |

3. Select the statements which pertain to the maximum allowable airspeed indicator.

- a. Indicates airspeed in the same manner as a standard type airspeed indicator.
- b. Provides the pilot with a simplified comparison of both airspeed and Mach number.
- c. Shows the maximum allowable speed at which a particular type aircraft can be safely operated.

4. Select the statements which pertain to the Mach number indicator.

- a. Shows both indicated airspeed and Mach number at low speeds.

ides the pilot with a simplified presentation of both airspeed and Mach number.

Airspeed and Mach number are read from the same hand but on separate dials.

The purpose of the maintenance checks of the indicator is to:

Determine the maximum safe flying speed for a particular type aircraft.

Determine the accuracy of the airspeed indicator.

Indicators or dial that indicate Mach number, maximum allowable airspeed, and indicated airspeed are subject to movements pertaining to their moving forces.

- |                             |   |
|-----------------------------|---|
| Mach number pointer         | a. Moves in direct relation to amount of movement of the diaphragm. |
| Max allowable airspeed dial |   |
| Indicated airspeed pointer  | b. Moves in direct relation to amount of movement of the aneroid.   |



oid assembly

metallic Temperature Compensator

mechanical linkage

indicator dial

metric dial

n

ing level flight

ing descent

ing ascent

es for adjusting the altimeter

53,000'  
2 965" Hg

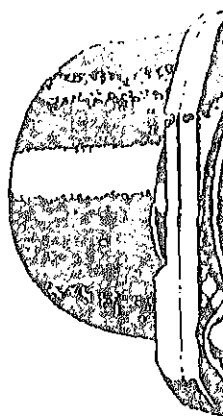
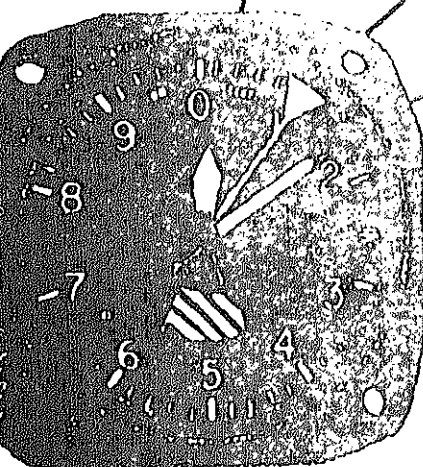
SEA LEVEL  
29.92" Hg

1 ANEROID WAFER

1,000 FOOT  
POINTER

10,000 FOOT  
POINTER

100 FOOT  
POINTER



INDICATED ALTITUDE 10,160 FEET

the air-pressure of the outside air in the  
the aircraft's height above a given reference

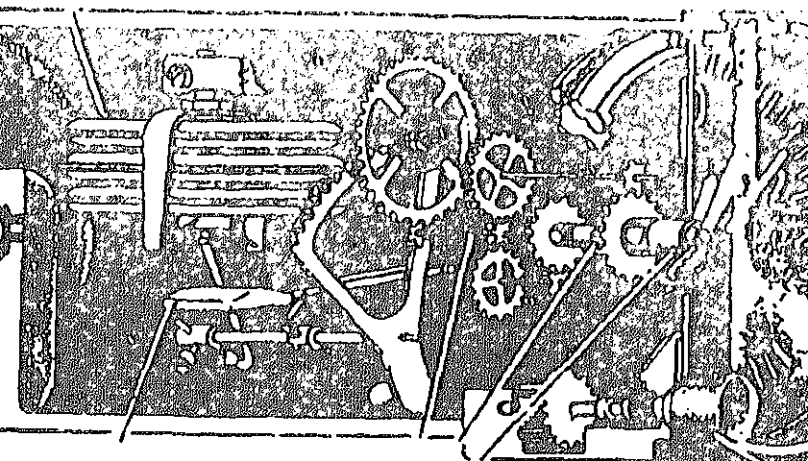
the components of the altimeter in Column  
se in Column A.

COLUMN A  
PURPOSE

COLUMN B  
COMPONENT

Displays the height of the aircraft in feet.	(1) Baromet
Displays the current field	(2) Aneroid
barometric pressure.	(3) Mechan
Changes linear motion of the	(4) Diaphra
aneroids to rotary motion.	(5) Spiral
Compensates for temperature	compens
changes in the cockpit.	(6) Indica
Senses a change in atmospheric	
pressure.	

to the illustration below. For each give  
the statements that describe the opera  
eter into their correct sequence. (1,2,3,



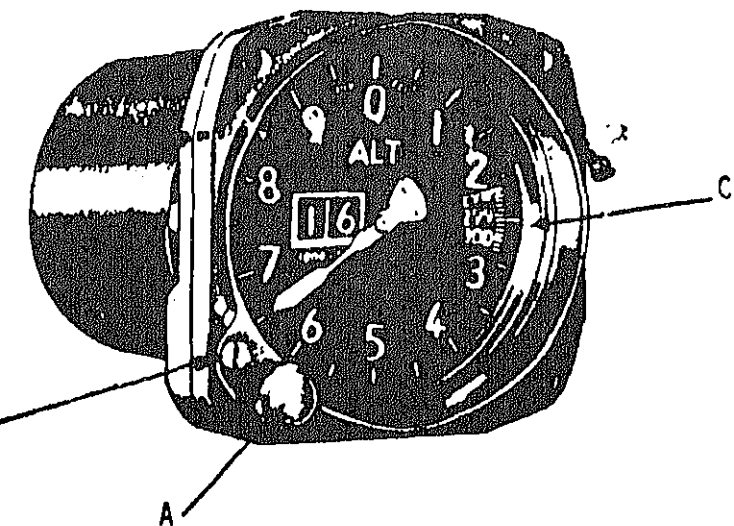
ing level flight:

mechanical linkage transmits change to the pointer  
craft commences a dive from present altitude

climb from level flight:

As air pressure decreases, the aneroid expands. The  
mechanical linkage transmits a change to the pointer.  
The craft commences a climb from present altitude.  
The indicator shows an increase in altitude.

Refer to the illustration below. Arrange the list  
below into a correct sequence that describes the steps  
for adjusting the altimeter to field elevation and  
barometric pressure.



Loosen set screw "B" so that it clears the flange.  
Pull the screw out to the left.

Turn the pointer to field elevation by slowly turning  
adjustment knob "A" and while tapping altimeter  
face knob "A" and tighten set screw "B".



1. SELECT from a list the sensitive element of climb indicator.
2. SELECT from a list the sensitive element of rate of climb indicator.
3. STATE the purpose of the diaphragm assembly.
4. STATE the purpose of the temperature and diffuser valve assembly.
5. SELECT from a list the description of the rate of climb indicator.
6. SELECT from a list the principle of operation of the rate of climb indicator.

---

## REFERENCES

---

Aviation Electrician's Mate 3 & 2, NAVPERC 10000  
Pages 469-471

Aviation Electrician's Mate Manual, NAVAE 10000  
Chapter 29

Naval Aircraft Instruments Handbook, NAVA 10000  
Section 1

# DIAPHRAM AND CASE PRESSURE

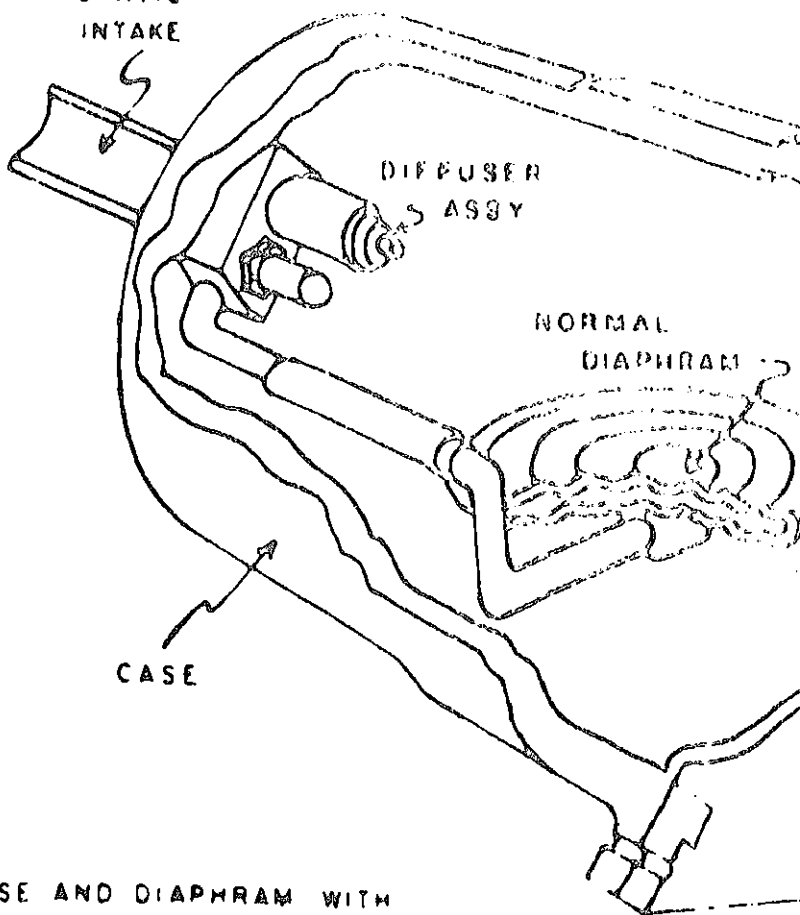
STATIC  
INTAKE

DIFFUSER  
ASSY

NORMAL  
DIAPHRAM

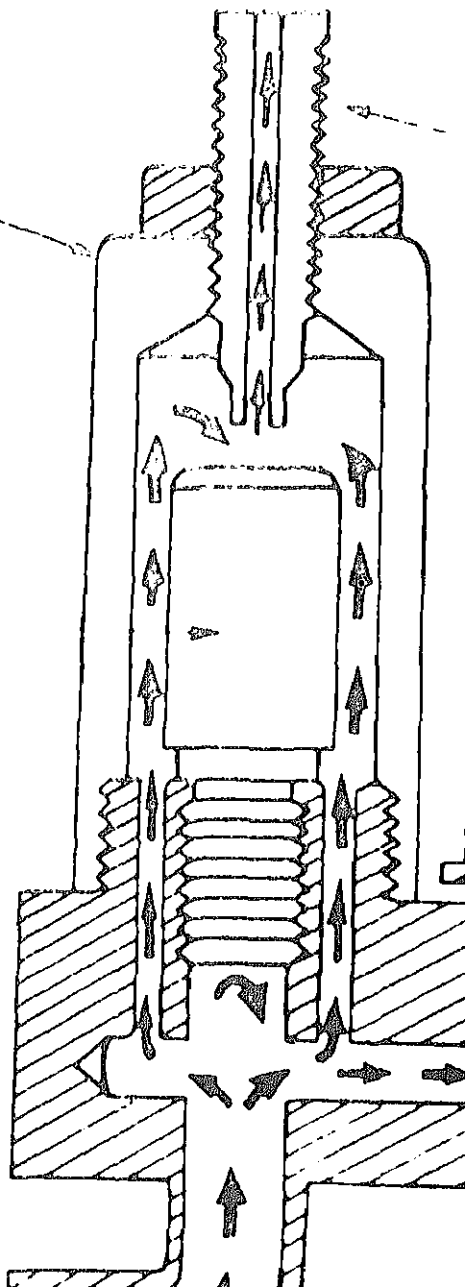
CASE

SE AND DIAPHRAM WITH  
CRAFT IN LEVEL FLIGHT



DURAL CAPILLARY  
SCREW MOLDER

AVAR  
VALVE SEAT



Connection

Diagram

Diagram Stops

Temperature Compensator and Diffuser Valve Assembly

Two Metering Units

(a)

(b)

Mechanical Linkage

Sector Gear

(a)

(b)

Pointer

Diagram

(b)

(c) Temperature Effect on Air  
1.  
2.

(d)

(5)

(6)

(7)

b. Level Flight

(1)

(2)

(3)

c. Descent

(1)

(2)

(3)

d. Ascent

(1)

(2)

(3)

4. Test and Calibration

Rate of Climb Indicator shows the rate of change in speed of the aircraft in feet per minute.

Rate of Climb Indicator shows the rate of change in altitude in feet per second about the vertical axis of the aircraft.

Rate of Climb Indicator shows the rate of change of altitude in feet per minute times 100.

Rate of Climb Indicator shows the rate at which an aircraft is changing altitude in feet per minute.

The sensitive element of the Rate of Climb Indicator is a Bourdon tube.

Bourdon

tube

diaphragm

Temperature compensator and diffuser valve assembly

The purpose of the diaphragm stops is to

prevent rupture of the diffuser

support the diffuser

prevent rupture of the diaphragm

support the diaphragm

The purpose of the temperature compensator and diffuser valve assembly is to

maintain the proper rate of change between the pressure in the case and the pressure in the atmosphere.

- . Dial is graduated 0 - 6 times 100 FPM
- . Dial is graduated 0 - 12 times 1000 FPM
- . Dial is graduated 0 - 12 times 100 FPM
- . Dial is graduated 0 - 6 times 1000 FPM

select the principle of operation of the Rate of Climb Indicator.

- . The Rate of Climb Indicator is essentially a very sensitive pitot pressure instrument.
- . The Rate of Climb Indicator is essentially a very sensitive differential pressure gauge which measures changes in pitot pressure.
- . The Rate of Climb Indicator is essentially a very sensitive differential pressure gauge which measures the rate of change in atmospheric pressure by changes in altitude.

E the purpose of the VPT-7A.

E the components of the VPT-7A and give the function of each.

E the power requirements for the VPT-7A.

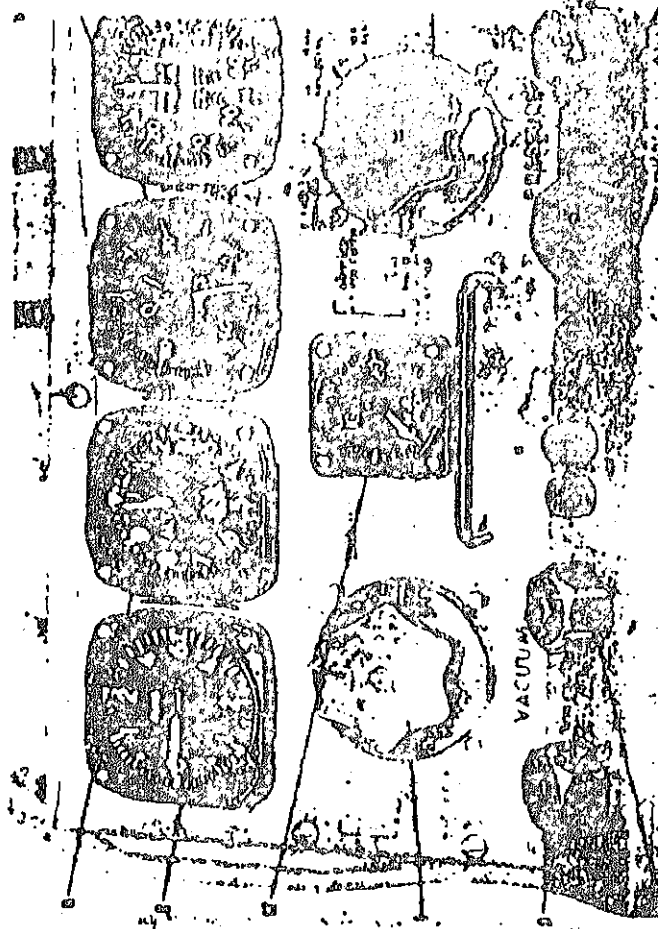
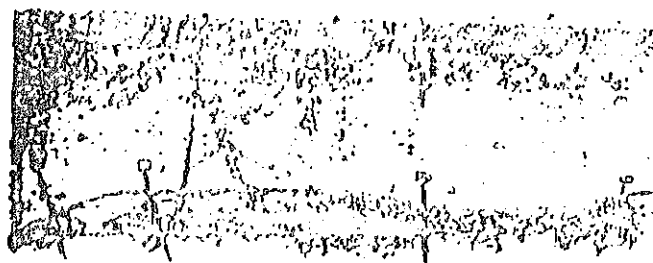
E the safety precautions for the VPT-7A.

E the malfunctions and probable causes in the pitot-static system.

---

of Operation and Service Instruction for  
Pressure Test Set, NAVAER 17-15C-539

of Maintenance Instruction, A-4C, A-4D,  
VB-6, Section VI Instruments





1. Power Connector

3. Manifold Pressure  
4. Airspeed

- c.
- d.
- e.

## Systems

### a. Vacuum Pressure System

#### (1) Air-Oil Reservoir

(a)

(b)

#### (2) Vacuum Control Valves

(a)

(b)

(c)

#### (3) Pressure Control Valves

(a)

(b)

(c)

#### (4) Vacuum Selector Valve

(a)

(b)

1.  
2.

#### (5) Pressure Selector Valve

(a)

(b)

1.  
2.

#### (6) Master Instruments

(d)

- 1.
- 2.
- 3.
- 4.
- 5.

0) Quick Couplings

(a)

(b)

(c) Labeling and Use

1. Fuel Pressure

2. Manifold Pressure

3. Airspeed

a.

b.

4. Altimeter and Rate of Climb

Electrical System

1) Design to Operate on

(a)

(b)

(c)

2) Power Switch

(a)

(b)

(c)

(d)

3) Indicator Light

(a)

(b)

(1)

(2)

d.

e.

#### Possible Troubles And Their Causes

a. Pitot Pressure Gives Incorrect Indication  
High Altitude or Low Temperatures

(1)

(2)

b. Pointers give incorrect indication on  
pitot pressure operated instruments

(1)

(2)

c. Pointers oscillate excessively or give  
indication on static or pitot pressure  
instruments

(1)

(2)

(3)

(4)

d. Pointers operate sluggishly at low temperature  
on pitot/static pressure operated instruments

(1)

e. Inaccurate indications on static pressure operated instruments

(1)

(2)

(3)

f. Inaccurate indication on pitot or static pressure  
operated instruments

or atmospheric pressures and vacuums

ately simulate engine or atmospheric pressures  
uums for the testing of aircraft instruments

ately simulate cockpit pressures and vacuums  
testing of aircraft instruments

Following components and their purpose.

- |  |                               |
|--|-------------------------------|
| s proper connections<br>vacuum                       | a. Vacuum control<br>valves   |
| s proper connections<br>pressure                     | b. Pressure control<br>valves |
| ides connections from<br>set to systems<br>g checked | c. Vacuum selector<br>valve   |
| rols amount of<br>sure applied during<br>st          | d. Pressure selector<br>valve |
| rols amount of<br>um applied during<br>t.            | e. Quick coupling             |

atement(s) concerning the air-oil reservoir

lubrication for the pump

to pressure side of the pump

of air and oil from the pump separated by

in the tester with no access ports

ver requirements for the VPT-7A.

115 VAC

Select the proper safety precaution(s) which observed when using the VPT-7A.

- a. Connect the power cable to the power supply before connecting it to the tester
- b. Do not change position of either select connect hose when any readings, other than power off indications, are observed
- c. Do not change position of either select disconnect hose when the motor is running
- d. Use force only when fully opening the test control valves and the two vacuum control valves

Select the best probable cause for incorrect readings on pitot pressure operated instrument altitudes or low temperatures.

- a. Vent port not open to atmosphere
- b. Leak in pitot and static line
- c. Pitot tube heater element defective
- d. Obstruction in pitot and static line

Select the best probable cause for sluggish movement of pointers on pressure operated instrument altitudes or low temperatures.

- a. Leak in static line
- b. Leak in static vent
- c. Moisture in system
- d. Loss of power to system

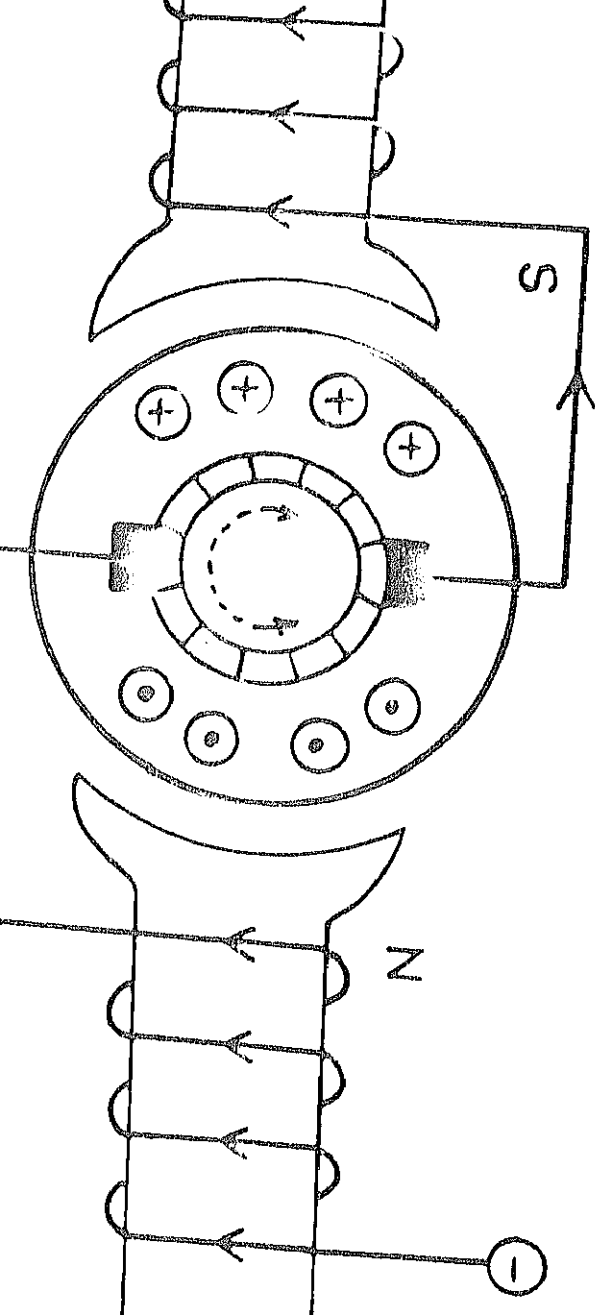


the principle of operation of an a.c.

2. MATCH each of the four types of a.c. respective descriptions.
3. MATCH each of the four types of a.c. statement concerning their construction.
4. MATCH each of the four types of a.c. statement concerning their operation.
5. MATCH each of the four types of a.c. particular use.
6. SELECT from a given list the inspect for a.c. motors.
7. LIST two troubleshooting checks for

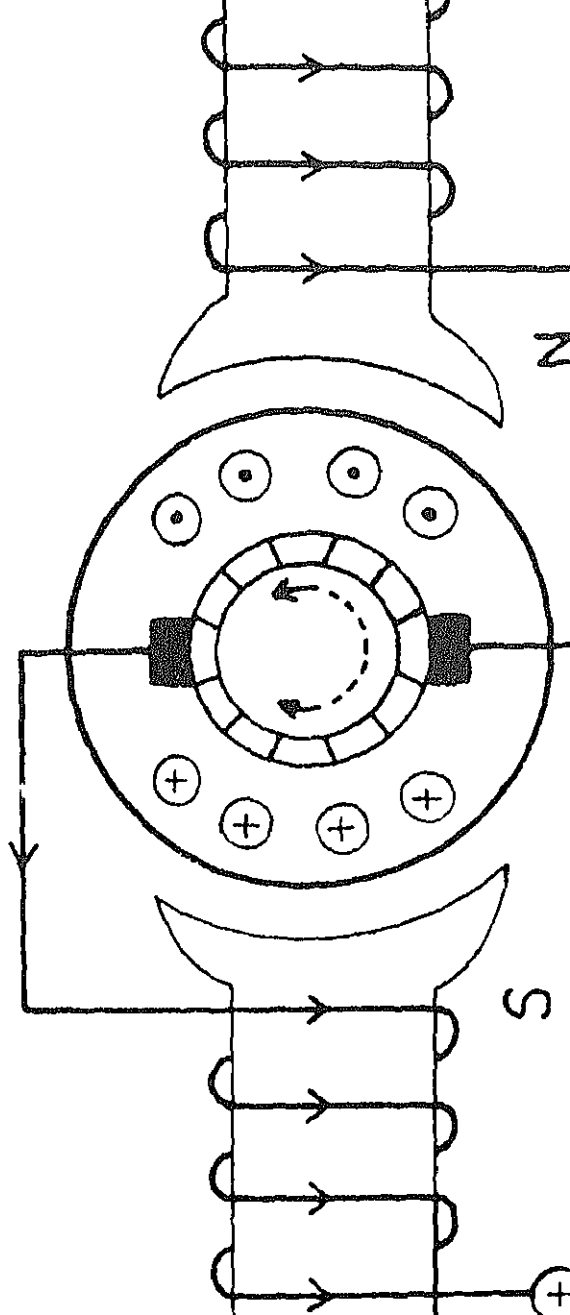
## REFERENCES

1. Basic Electricity, NAVPERS 10086-B, Page
2. Aviation Electrician's Mate 3 & 2, NAVPERS 10086-B, Pages 185-186



# ries Motor Operation

## No. 2



ic Construction

ic Operation

S

(2)

#### 4. Induction Motors

##### a. Single Phase Induction Motor

(1) Definition

(2) Basic Construction

(a) Stator

(b) Rotor

(c) Capacitor

(d) Centrifugal Switch

(3) Basic Operation

(a)

(b)

(c)

(d)

(4) Use

##### b. Polyphase Induction Motors

(1) Definition

(2) Basic Construction

(a) Stator

1.

2.

(b) Rotor

(c)

(d)

(4) Use

Synchronous Motor

(1) Definition

(2) Basic Construction

(a) Stator

(b) Rotor

(3) Basic Operation

(a)

(b)

(c)

(d)

(e)

(f)

(4) Use

(a)

(b)

(2)

(3)

nted 90° out of phase.

each of the four types of a.c. motors in C  
their respective descriptions in Column B.

Column A

Column B

Series motor	1. A motor oper a single pha supply
Single phase induction motor	2. A motor whic at a constan under varyin conditions
Polyphase induction motor	3. A motor in v same value o flows throug as the armat
Synchronous motor	4. A motor whic on two or mo voltages wh out of phase

each of the four types of motors listed in  
statement concerning their construction lis  
B.

Column A

Column B

Series motor	1. A motor whic a wire wound a commutator
--------------	---

fugal s

\_\_\_d. Synchronous motor

4. A motor  
two or  
winding

MATCH each of the four types of a.c. mo  
to a statement concerning their operati

Column A

Co

\_\_\_a. Series motor

1. A rotat  
induces  
squirre  
produce

\_\_\_b. Single phase  
induction motor

\_\_\_c. Polyphase  
induction motor

2. High cu  
to the  
brushes  
startin

\_\_\_d. Synchronous motor

3. D.C. is  
rotor t  
tic loc  
and arm

4. A capac  
split p  
two out

MATCH each of the four types of a.c. mo  
to their use listed in Column B.

Column A

Col

\_\_\_a. Series motor

1. Instrum  
and pro  
CKTs

\_\_\_b. Single phase  
induction motor

2. Actuator  
heavy p

\_\_\_c. Polyphase

alignment of mechanical drive

correct output voltage

the two troubleshooting checks for a.c. motor:

---

---

ST

1. The following instructions are for the use of the  
 2. (a) The following instructions are for the use of the

3. The following instructions are for the use of the  
 4. (a) The following instructions are for the use of the

5. The following instructions are for the use of the  
 6. (a) The following instructions are for the use of the

7. The following instructions are for the use of the  
 8. (a) The following instructions are for the use of the

9. The following instructions are for the use of the  
 10. (a) The following instructions are for the use of the

11. The following instructions are for the use of the  
 12. (a) The following instructions are for the use of the

13. The following instructions are for the use of the  
 14. (a) The following instructions are for the use of the



(a) Drive Phase

(b) Control Phase

(3) Components

(a) Rudder Trim Switch

(b) Rudder Trim Actuator

(4) Operation

(a)

(b)

(c)

(5) Troubleshooting

(a)

(b)

(c)

b. Horizontal Stabilizer Trim

(1) Purpose

(2) Power Requirements

(a) Actuator

(b) Control

(3) Components

(a) Trim Switch

(b) Trim Transfer Relay

(c) Control Relay Assembly

(d) Stabilizer Actuator

(4) Operation

(a)

16 April 1972

(f)

(g)

(h)

(i)

(j)

(5) Manual Override Lever

(a) Purpose

(b) Location

(c) Operation

(6) Troubleshooting

(a)

(b)

(c)

(d)

c. Aileron Trim (Manual)

(1) Purpose

(2) Power Requirements

(a) Drive Phase

(b) Control Phase

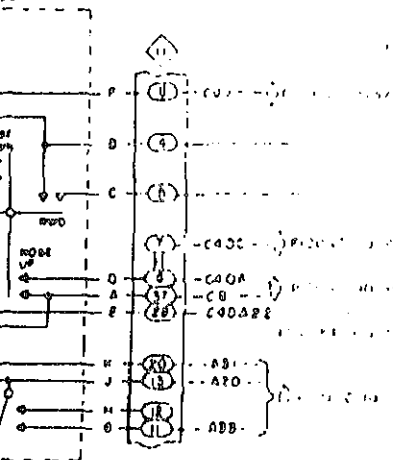
(3) Components

(a) Trim Button

(b) Aileron Trim Normal-En

ALBERT H. ...  
 DON ...

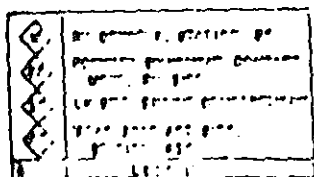
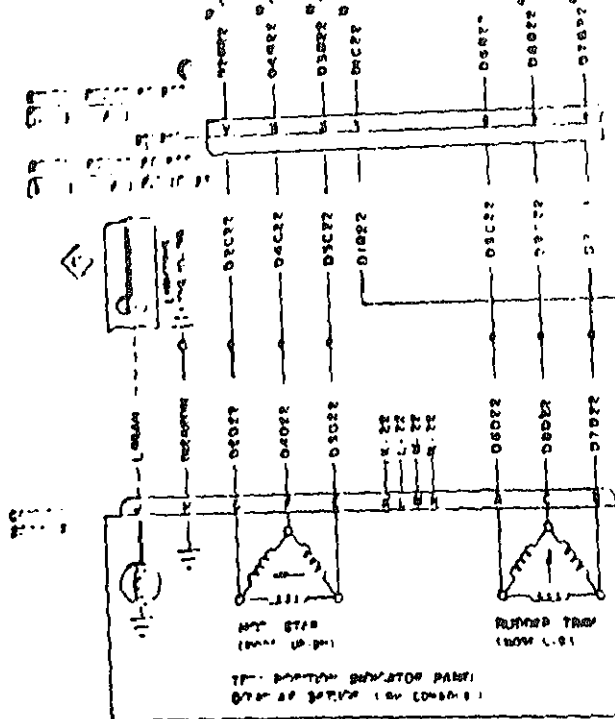
ORIP ADDRESS  
 90



1. STATION 90  
 EQUIPMENT CONNECTION  
 EQUIPMENT CONNECTION  
 EQUIPMENT CONNECTION  
 EQUIPMENT CONNECTION  
 EQUIPMENT CONNECTION  
 EQUIPMENT CONNECTION

6.000

...



WIRE

2 PIP 10-10-7159 (1000-9)

1 ACCEPTABLE TO POT HOR STAB POOR  
WIRE PLUS WITHOUT SERVING WIRE

2 10-10-7159 (1000-9)  
AND: 10-10-7159 (1000-9)

Figure 10-21. Horizontal Stabilizer and Rudder Trim Pot

(a)

(b)

(c)

) Troubleshooting

(a)

(b)

(c)

(d)

(e)

Position Indicators  
urpose

ocation

to automatically trim the aircraft in pitch by placing the entire stabilizer surface.

- b. To manually trim the aircraft in pitch by placing the entire stabilizer surface.

From the list below match the power required for each trim function.

- |                           |                  |
|---------------------------|------------------|
| _____ (1) Rudder trim     | a. 28 v.d.c.     |
| _____ (2) Horizontal trim | b. 115 v.a.c.    |
| _____ (3) Aileron trim    | c. 115 v.a.c.    |
|                           | d. 115 v.d.c.    |
|                           | e. Two 26 v.a.c. |

Select the statements that indicate correct operation of the rudder trim switch in nose left position.

- a. Control power is received from Mont. C power supply.
- b. Control coil receives power from 26 v.a.c.
- c. Trim actuator is now controlled by AFCS.
- d. Actuator is driven left by 28 v.d.c.

Select the statements that indicate correct operation of the manual override lever in the nose down position.

- a. The 28 v.d.c. is removed from the transfer switch.
- b. Control relay is mechanically closed.
- c. Nose down coil of the control relay is energized.
- d. 28 v.d.c. power is applied to the bottom right coil of the actuator.

V.A.C. is applied to term #4 on the aileron  
or through contacts 4 and 5 of aileron tri  
n transfer energizes

erons will be moved if the AFCS is not eng

to them. Inspection with the statements th

PERFORM a Daily and Preflight Inspection applicable aircraft utilizing MRC's.

DOCUMENT the compliance of the Daily and MRC's.

---

CES

al Aviation Maintenance Program, OPNAVINST  
tion Electrician's Mate 3 & 2, NAVPERS 103  
59



(2)

b. Responsibilities

(1)

(2) Consists of inspecting for

(a)

(b)

(c)

(d)

(e)

c. Application

(1)

(2)

(3)

(4)

(5)

2. Preflight Inspection

a. Purpose

(1)

(2)

(3)

b. Responsibility

(1)

(2) Following MRC

(a)

(b)

(c)

(d)

(e)

(f)

c. Application

(4)

(5)

around

Purpose

(1)

(2)

(3)

(4)

Responsibility

(1)

(2) Following MRC deck

(a)

(b)

(c)

(d)

(e)

(f)

Application

(1)

(2)

(3)

(4)

(5)

ial Inspections

CARD	TIME	RTG. AO NO. 1	TURNAROUND  PUBLICATION NUMBER NAVAIR 01-40AVA-6-1	GUN CLEANING AND BORE EROSION		ELEC PWR
				CARD SET DATE	CHANGE IN	HYD PWR
12	00:20			1 December 1972		
TASK MIN.	WORK AREA	MOS 6511 NO. 1				

Assisted by AO-2 (20.0)

NOTE: Perform after each gun firing or if used throughout the day, not to exceed 1000 rounds.

SPECIAL TOOLS/EQUIPMENT  
M10 (T23)  
Gage, Bore Erosion

CONSUMABLES/REPLACEMENT PARTS  
MS20995C32  
Lockwire

WARNING: Ordnance safety precautions NAVORD OP 3347 must be complied with.

- 1 Clean LH and RH gun in accordance with NAVAIR 11-95-2.
- 2 Insert bore erosion gage and measure in accordance with ABB 440
  - a MK 11 MODS 2/3 barrel, reject if reading 0.046" or greater.
  - b MK 11 MOD 4 barrel, reject if reading 0.057" or greater.

10.0

5, 6

10.0

the purpose of the Daily/Preflight, Turnaround Inspections with the statements that per

described interval other than Preflight, Post flight, Daily, Turnaround, Calendar/used.

a.	Preflight
b.	Daily insp
c.	Turnaround
d.	Special in

The Daily inspection does not satisfy the maintenance requirements.

All requirements are obtained within the daily, and the daily is accomplished prior to the first flight of the day, the inspection requirements are satisfied.

be considered valid for period of 24 hours provided aircraft has NOT flown during this period.

be considered valid for period of 72 hours, provided aircraft has NOT flown during this period.

es the place of the preflight and post flight inspections.

- a casual, phased inspection.
2. PERFORM the "LOOK" phase portion of a C Phased inspection and the proper documentation of compliance with the Maintenance Requirement Cards.
  3. PERFORM the "FIX" phased portion of a C Phased inspection and the proper documentation of the discrepancies repaired.

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## REFERENCE

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Manual, Naval Aviation Maintenance Program  
4790.2A, Volume II, Chapter II

Assisted by  
**SPECIAL TOOLS/EQUIPMENT**

**Power Source, Electric**  
**Test Set, Vacuum Pressure**

**VPT-10F-11072**

**CONSUMABLES/REPLACEMENT PARTS**

**Tape, Pressure Sensitive Adhesive**

**PPP-T-80**

**1. Pitot-static system:**

- a. pitot tube orifice and drain ports for obstructions.
- b. static air vents for obstructions.
- c. remove pitot-static drain traps, two located in nose wheel well and two engine compartment and check for moisture; install caps.

**2. Pitot-static system test:**

- a. seal aft drain port on pitot tube and orifices on RH and LH (A) air vent with tape.
- b. install static air vent test adapter on LH static air vent.
- c. install pitot tube test adapter on pitot tube.

**CARD**

**PUBLICATION NUMBER**

**CHANGE NO.**

**20.1**

**NAVAIR 01-40AVA-6-4**

- d. connect hose to pitot tube adapter and to pitot quick-disconnect set.
- e. connect hose to static air vent test adapter and to vacuum for test set at rear of test set.
- f. connect electrical power source to test set. Refer to NAVWEI 01-40AVA-6-4.
- g. verify instrument panel vibrator and altimeter vibrator operation.

**CAUTION:** Do not disconnect test hoses while test set is energized. Other than minimum ambient can be observed on indicators.

- h. set power switch on test set to RUN and close emergency pitot relief valves.
- i. set barometric dials on aircraft altimeters to agree with test set.
- j. set altitude monitor to 500' above ambient altitude and slowly increase and descent control. Do not exceed 8000 fpm.

**OPERATION**

**RESULTS**

- k. set airspeed to 500 kn, allow pressure to stabilize
- l. depress pitot leak test button.

Airspeed and mach number aircraft should read 500 kn. After 1 minute, airspeed indicators in aircraft should read 500 kn.

(c)

- (2) Calendar Inspection Intervals
- b. Certification of Compliance
- c. Organizational Procedure
  - (1) Check Crew Supervisor(CCS)
  - (2) Calendar Inspection Crew
    - (a)
    - (b)
  - (3) Calendar Inspection Completion

#### Phased Maintenance Inspection

- a. Description
  - (1)
  - (2)
  - (3)
- b. Certification of Compliance

1. Select the statements which describes  
(Refer to list below).
2. Select the statements which describes
  - a. Verifies that the equipment has be
  - b. A thorough and searching examination
  - c. Performed prior to the first flight
  - d. Performed immediately after incident  
if there is damage.
  - e. An inspection in which the maintainers  
are divided into small packages co  
imately the same work load.